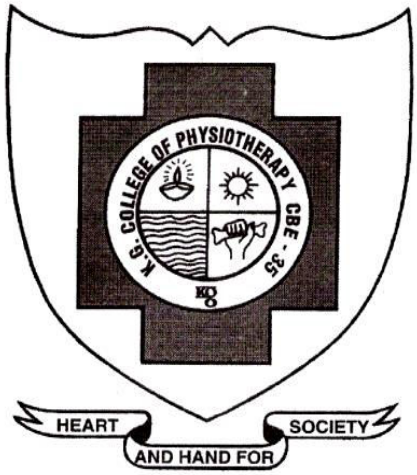
THE EFFECTIVENESS OF SLOW BREATHING TRAINING ALONG WITH CONVENTIONAL PHYSIOTHERAPY IN IMPROVING CARDIO RESPIRATORY CONTROL AND EXERCISE CAPACITY IN PATIENTS WITH ESSENTIAL HYPERTENSION



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ELECTIVE: PHYSIOTHERAPY IN CARDIO RESPIRATORY

A DISSERTATION SUBMITTED TO THE TAMILNADU

DR. M. G. R MEDICAL UNIVERSITY, CHENNAI.

AS PARTIAL FULFILLMENT OF THE

MASTER OF PHYSIOTHERAPY DEGREE

APRIL 2016

CERTIFICATE

Certified that this is the bonafide work of **Ms. C. Manoranjitham** of K. G. College of Physiotherapy, Coimbatore submitted in partial fulfillment of the requirements for master of physiotherapy degree course from the Tamil Nadu Dr. M.G.R medical university under the **Registration No: 271430181** for the April 2016 examination.

Date: Principal

A Dissertation on

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Has been submitted in partial fulfillment for the requirement of the

Master of Physiotherapy degree

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Internal examiner

External examiner

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I INTRODUCTION

Hypertension is major risk factor for cardio vascular morbidity and mortality. It accelerates the process of atherosclerosis in the coronary, cerebral, renal arteries as well as increasing the work load of the heart. Hypertensive patient is at risk of developing myocardial infarction, stroke, renal failure, congestive heart failure**.** Hypertension is a elevated blood pressure and also a scientific problem of un expected complexity. The cause of elevated blood pressure is unknown. A condition termed primary or essential hypertension**.[Leonard s. Lilly 2011]**

Hypertension means normally increase in the blood pressure both in systolic and the diastolic blood pressure. According to joint national committee the systolic blood pressure is above 140-160 mm Hg, diastolic above 90-100 mmHg is considered as hypertension.[**JNC 7TH -2003]**

Most of the individuals with hypertension have no specific cause of their disease and are said to have primary or essential hypertension. Essential hypertension usually cluster with other cardiovascular risk factors such as ageing, being overweight, insulin resistance, high alcohol intake, high salt intake, a sedentary life style, stress, low sodium, potassium intake. Cigarette smoking, Hypercholesterolemia induce dysfunction of the endothelial layer of the coronary arterial which inturn the development of arthrosclerosis.

World wide raised blood pressure is estimated to cause 7.5 million deaths about12.8% of total all deaths. In India 33% in urban and 25% in rural adult Indians are hypertensive which means one third of urban adult Indians and one fourth of rural adult Indians are hypertensive**[Lancet 2012].** Essential hypertension characteristically arises after young adulthood and its prevalence increases with the age. The systolic blood pressure increases throughout the adult life until about the age of 50 year.

Essential hypertension is a syndrome that may arise from many potential abnormalities but it exhibits a characteristic haemodynamic profile. The primary defects may located at central nervous system, arterial baroreceptors, adrenal hormonal secretions. Abnormal regulation of these sites can contribute to elevated blood pressure [**christopherT.Leo 2011].**

In hypertension there will be a structural alterations takes place in the arterioles. Sustained hypertension will cause hypertrophy of myocardial cells which leads to ischemia and reduced ventricular compliance. The regulation of blood pressure is an integrated mechanism which involves the correlated activities of the vasomotor system and the physical and chemical bearings of the circulatory state. In regulation of blood pressure the vasomotor organisation is aimed at regulating the cardiac output and peripheral resistance **[Leonard.S Lilly 2011].**

The structure of blood vessels are functionally oriented the arteries are to overcome the force of contraction of heart and the pressure exerted on the column of blood. Therefore their walls are thicker, more elastic and distensible and their intra luminal pressure is higher..[**Ghose and Sahana 1984**].

Baroreceptors are the stretch receptors found in the walls of the heart and blood vessels. They are stimulated by distension of the structure in which they are lie. They are situated in the arch of aorta and carotid sinus. Exitation of the receptors can cause reflex drop in the blood pressure. They run along the vagus nerve to vasomotor center in the medulla. Chemo receptors are situated in the carotid body. Each contains irregular masses of epitheloid cells which are specialized to receive chemical stimuli, hence they are called chemoreceptors. Fall of pH, rise in CO_2 or fall in O_2 content of the blood leads to stimulation of chemoreceptors and give rise to impulses which travel up the sinus nerve to vasomotor center. Stimulation of vasomotor center leads to vasoconstriction. **[chakrabarthi 1984].**

Cardio respiratory control is continuously adapted to changes in the metabolic, environmental, behavioral and developmental conditions of the body. Any factor altering the cardio respiratory control can become detrimental to body. Thus making cardio respiratory control is a core issue in physiology and

pathophysiology. Cardio respiratory control is ability of the body to transport oxygen to muscles during prolonged exercise. [**ThiagoS.Morreira2014]**

Breathing exercises controlled at 7to 8 cycles per minute are known as slow controlled breathing exercises. Deep slow breathing can provide stress relief, lower the blood pressure and reduce anxiety. (**Lindal Ray2015).**

Slow Breathing exercises decreases sympathetic activity improves cardiovascular and respiratory functions. It will increase the baroreflex sensitivity and reduce chemoreflex activation. There by it will reduce systolic, diastolic Blood pressures as well as heart rate in persons with hypertension .Slow breathing training is a breathing exercise performed 7 to 8 cycles per minute by increasing the respiratory amplitude and decreasing respiratory rate. When the tidal volume increased it stimulates baroreceptors and vagus nerve. It sends impulses to vasomotor center where it inhibits sympathetic nervous system out flow and exit the parasympathetic system effects. It causes decreased peripheral vascular resistance and cardiac output tends to lowering blood pressure. . [**LAE Mohamed 2014].**

The Aerobic exercises reduces blood pressure in hypertensive persons. It will reduce nor adrenalin thus inhibition of sympathetic activity. And also it will reduce circulating angiotensin II which reduces peripheral vascular resistance and

increase baroreceptor sensitivity. Optimal exercise programme and physical activities will decrease the blood pressure. Hypertension is a major risk factor of cardio vascular disease. Slow breathing exercises and aerobic exercises has major role in reduction of blood pressure and improves the exercise capacity**.[JA.Hallbert 1997].**

Six minute walk test is useful test that is accessible to any physician and it represents an accurate and efficient method of quantifying exercises tolerance. It has the good reliability and validity in measuring exercise capacity. Standardization of training in the use of the six minute walk test are essential for health professional especially for those involved in treatment of patients with essential hypertension.[**JE Morales Blanhir 2011].**

Category of rating of perceived exertion according to the Borg scale offer a sensitive and reliable measure of stress encountered during work.[BA. Stamford 1976].The digital sphygmomanometer device showed a high level of agreement with the mercury manometer. The growing use of digital manometer for measuring blood pressure is positive in terms of public health. It can make blood pressure monitoring more accessible to the population.

Conservatively, the essential hypertension patients were treated with medications, education, relaxation, problem solving training, diet control.. But it

will control the hypertension not cure that. Traditionally, there is many physiotherapy management for essential hypertension called conventional physiotherapy. Progressive muscle relaxation technique, strength training, continuous and interval aerobic exercise program, yoga and music therapy, weight reduction exercise program, smoking cessation and diet control program are the management for essential hypertension.

Aim of the study is to analyse the effect of Slow breathing training and aerobic exercises in the management of essential hypertension.

1.1 NEED FOR THE STUDY

Essential hypertension is a common cardiac problem and There is no specific cause for essential hypertension. Mental stress may induce hypertension. Management of hypertension will help to relieve the stress. Various physiotherapy techniques are used for the regulation of blood pressure. Recent literatures suggested that Slow breathing training and aerobic exercises are very useful technique in controlling blood pressure and proves to be a growing treatment technique which has proved effective too.

Hypertension means increase in normal blood pressure both in systolic and diastolic blood pressure. It accelerates the process of atherosclerosis in the coronary, cerebral, renal arteries as well as increasing the work load of the heart. Hypertensive patient is at risk of developing myocardial infarction, stroke, renal failure, congestive heart failure.

Slow breathing exercises decreases sympathetic activity improves cardiovascular and respiratory functions. It will increase the baroreflex sensitivity and reduce chemoreflex activation. There by it will reduce systolic, diastolic Blood pressures as well as Heart rate in persons with hypertension.

Aerobic exercises is a useful adjunctive therapy in treating hypertension. It will reduce systolic blood pressure and diastolic blood pressure there by it will reduce cardiovascular risk for all hypertension.

So the aim of the study is to analyse the effectiveness of slow breathing training along with aerobic exercises in cardio respiratory control in patients with essential hypertension.

1.2 KEYWORDS

- **Essential hypertension**;

  Individual with hypertension have no specific cause for their disease and are said to have primary or essential hypertension.

- **slow breathing exercises;**

  Breathing exercise controlled at 7-8 rate per minute are known as slow breathing exercises.

- **aerobic exercises;**

  Exercises performed with oxygen utilization is called aerobic exercises.

- **six minute walk test;**

  Six minute walk test is a valuable tool for assessing pulmonary impairment, exercise capacity of individual.

1.3 AIMS

Aim of the study is to analyse the effectiveness of slow breathing training along with conventional exercise in patients with essential hypertension.

1.4 OBJECTIVES

- To assess the effectiveness of slow breathing training along with conventional physiotherapy in improving cardiorespiratory control and exercise capacity in patients with essential hypertension.
- To assess the effectiveness of conventional physiotherapy in improving cardio respiratory control and exercise capacity in patients with essential hypertension.
- To compare between the effectiveness of slow breathing training along with conventional physiotherapy alone improving cardiorespiratory control and exercise capacity in patients with essential hypertension.

1.5 HYPOTHESIS

Null hypothesis

There is no significant differences between slow breathing training along with conventional physiotherapy and conventional physiotherapy alone in cardiorespiratory control and exercise capacity in patients with essential hypertension.

Alternative hypothesis

There is significant differences between slow breathing training along with conventional physiotherapy and conventional physiotherapy alone in cardiorespiratory control and exercise capacity in patients with essential hypertension.

II REVIEW OF LITERATURE

HYPERTENSION

1. OA carretero et.al (2000) States hypertension is the term used to describe high Blood pressure. Essential hypertension means that the cause of Blood pressure is not known. There is evidence that ageing, being overweight, insulin resistance, high alcohol intake, high salt intake, a sedentary life style, stress, low sodium, potassium intake increases blood pressure in susceptible subjects. Essential hypertension remains major modifiable risk factor for cardio vascular diseases.

2. Lanset. et.al(2007) states essential Hypertension can be defined as a rise in blood pressure of unknown cause that increases risk for cerebral, cardiovascular renal events. The risk of becoming hypertensive is systolic blood pressure greater than 140 mm Hg, diastolic blood pressure is 90 mm Hg. Events such as stroke, heart attack, renal failure, dementia can happens after long periods of uncontrolled hypertension.

EXERCISE CAPACITY

1. Kokkinos, et.al. (2000) stated regularly performed aerobic exercises significantly lowers blood pressure in patients with essential hypertension. Mild to moderate intensity exercises more effective in lower blood pressure than high

intensity exercises. A significant reduction in blood pressure and regression of left ventricular hypertrophy may be achieved in these patients even after substantial reduction in antihypertensive medication. Moderate exercises has significant and positive and clinical implications for all hypertensive patients**.**

2. HK.kim et.al (2003) stated exercise capacity was the strongest predictor of all cause mortality in Hypertension. Left ventricular contractile reserve and relaxation property are important cardiac factors determining exercise capacity. Early diastolic longitudinal myocardial velocity might be useful for identifying hypertensive patients with poor exercise capacity.

3. W.Kosmala.et.al (2003) The aim of the study was to investigate the factors influencing exercise capacity in hypertensive patients. That concluded that hypertensive patients have reduced circulating apelin level and lower plasma apelin are more profound left ventricular systolic and diastolic impairment**.**

SLOW BREATHING TECHNIQUE

1. AVTurakar (2013) states that the practice of slow breathing exercises on regular basis will increase the baroreflex sensitivity and decreases the sympathetic tone. Regular practice of slow breathing has been shown to improve cardio vascular and respiratory function and decrease the effect of stress. This pilot study was planned to evaluate the short term effects of pranayama on cardio vascular

function. Beneficial effect of pranayama started to appearing with a week of regular practice.

2. LAE Mohamed et.al.(2014) suggested that practicing slow breathing exercise will decrease the systolic blood pressure, diastolic blood pressure and heart rate of patients with essential hypertension. To examine the effect of slow deep breathing exercises on heart rate and blood pressure among newly diagnosed patients with essential hypertension. It is a quasi experimental study design. The study was conducted in government hospital. A sample of 120 adult patient where taken a structured interview questioner covers personal and medical background data. In assessment data sheet most of them males. Aged range 50 to 60 years high statistical difference found in systolic blood pressure and diastolic blood pressure before and after intervention . Thus conclude slow breathing exercises decrease the systolic blood pressure, diastolic blood pressure and heart rate of patients with essential hypertension.

3. Luciano Bernardi et.al.(2005) Suggested Slow breathing exercises acutely reduces blood pressure in hypertension. It improves autonomic balances and cardio respiratory control. To investigate whether breathing more slowly modifies the sensitivity of chemoreflex and baroreflex. Progressive isocapnic hypoxia and progressive hyperoxic hypercapnic where measured during spontaneous breathing and during breathing rate fixed at 6 breaths per minute. There was variation in

chemo and baroreflex sensitivity induced by different breathing rate. When comparing both groups baroreflex sensitivity was greater during slow breathing. So slow breathing training reduces chemo reflex.

4. CN Joseph.et.al (2005) States that slow breathing exercises reduces blood pressure and enhances Baroreflex sensitivity in essential hypertensive patients. Slow breathing at 6 cycles per minute increases baroreflex sensitivity and reduces sympathetic activity, chemo reflex activity. They were selected 20 patients with essential hypertension and divided into two. One receiving slow breathing training and other receiving fast breathing training. They concluded slow breathing was capable of decreasing blood pressure in hypertension.

5. DE.Anderson et.al (2010) States that slow breathing exercises decreases the resting blood pressure, ambulatory systolic blood pressure and breathing rate and increasing the tidal volume. This study investigated that effects of daily practice of device guided on essential hypertension. 40 patients were trained to decreasing the breathing rate through device guided breathing. It was performed daily 15 minutes per session for 4 weeks.

6. T.pramani k.et.al (2009) Concluded slow breathing exercises will reduce systolic blood pressure and diastolic blood pressure by activate the parasympathetic system and Inhibit the sympathetic system.

7.Grossman.et.al.(2001) Concluded slow breathing exercises improves autonomic balance by inhibit chemoreceptor and activate baroreceptors. They hypothesise that routinely applied short sessions of slow and regular breathing can lower blood pressure by using interaction of music. Hypertension patients guided towards slow and regular breathing. This study evaluates the efficacy of breath with interacting music in lowering blood pressure. They were selected 33 patients aged 35 to 55 years with uncontrolled blood pressure. Slow and regular breathing has the beneficial effect on essential hypertension.

AEROBIC EXERCISES

1. JA.Ruivo et.al (2012) Concluded aerobic exercises is a useful adjunctive therapy in treating hypertension. It will reduce systolic blood pressure and diastolic blood pressure there by it will reduce cardiovascular risk for all hypertension. Body movements produce contraction of muscles, increasing energy expenditure above baseline level. The adaptation of health life style in which exercises is recommended for treatment and prevention of hyper tension program include endurance, resistance training play important role on lowering blood pressure in essential hypertension.

2. Emmanuvel,Gomas et,al(2012).In this study continues moderate intensity training given to one group and high intensity interval training with 85-95% VO2

max was given to other group and suggested that high intensity exercise training is more effective for controlling hypertension.

3. Flellamo et.al (2010) states that Aerobic exercises have greater importance in hypertension and its complication. High blood pressure is a serious public health problem. World wide increased blood pressure lead to stroke, chronic heart diseases, congestive heart failure. Physical in activity is a recognized major risk factor cardio vascular disease persons who are less active and less fit have a 30 % to 50% greater risk for high blood pressure aerobic exercises reduces insulin resistance and insulin level through complex interaction of endothelial function and sympathetic nervous system activity .

4. Harald Edvard Hansen et.al (2000) Suggest aerobic training is an effective training to lower blood pressure and improve cardio respiratory control. Regular physical activity proved to be effective in improving pharmacological control, aerobic endurance exercises appears to be more effective at lowering blood pressure than their kinds of exercises, including resistance training.

5. Seamus P. Whalton.et.al.(2001) Concluded aerobic exercise improves the exercise capacity in patients with hypertension by maximize the amount of oxygen uptake.

6. HenrigueL.Monterio et.al.(2006) Concluded that aerobic exercise training significantly reduced systolic arterial pressure. It improves cardio respiratory control and flexibility.

7. Halbert JA at.al (1997) Stated that aerobic exercise training had a small but clinically significant effect in reducing systolic and diastolic Blood Pressure.

SIX MINUTE WALK TEST

1. Cartere stocks. et al (2003) Stated that six minute walk test is required to estimate a patients functional capacity and submaximal exercise capacity.

2. JE.Morales,Blanhir et.al-(2011) Six minute walk test is useful test that is accessible to any physician and it represents an accurate and efficient method of quantifying exercises tolerance. Standardization of training in the use of the six minute walk test are essential for health professional especially for those involved in treatment of patients with essential hypertension.

3. Sao paula.et.al (2014) evaluate the functional capacity of the hypertensive patient by using six minute walk test. Six minute walk test assess the tolerances of self limited exercises and activities of daily living. So it becomes clinically attractive. They conclude that six minute walk test is an indicator of functional capacity in hypertensive patients and found that exercise capacity was decreased in hypertension.

4. Cordon H.guyatt et.al (1985) concluded that the 6minute walk test is a useful measure of functional capacity and suitable outcome measure for clinical trials in patients with Hypertension.

5. Samuel C. Dumith et al (2010) states that the digital device show high level of agreement with the mercury manometer when measuring blood pressure. The growing use of digital manometer for measuring blood pressure is positive in terms of public health. It can make blood pressure monitoring more acessible to the population.

6. BA.Stamford(1976) states that the category of rating of perceived exertion according to the Borg scale offer a sensitive and reliable measure of stress encountered during work.

III .METHODOLOGY

3.1 STUDY DISIGN

Experimental study design

3.2 STUDY SETTING

Departmental of cardiology, KG hospital

3.3 STUDY DURATION

Study duration of the study was six months and individual treatment duration was 4 weeks.

3.4 SAMPLE METHOD

Simple random sampling method.

3.5 SAMPLE SIZE

40 patients were selected who fulfilled the inclusion and exclusion criteria and divided into two groups each consisted of 20 patients.

3.6 CRITERIA FOR SELECTION;

Inclusion criteria

- Patients diagnosed with essential hypertension.
- Patients with systolic blood pressure above 140-160mmHg.
- Patients with diastolic blood pressure above 90- 100mmHg.
- Patients between age group 35 to 55.
- Both sexes were included.
- Patients willing for the study
- Patients on antihypertensive drugs for a period of 6 month.

Exclusion criteria

- Patients diagnosed with secondary hypertension.
- Patients with diabetes mellitus and dyslipidemia.
- Patients diagnosed with aneurysm.
- Patients with intermittent claudication
- Patients who are not willing for study.

3.7 VARIABLES

Independent variable

1. Slow breathing training
2. Conventional physiotherapy

Dependent variable

1. Systolic blood pressure
2. Diastolic blood pressure
3. Six minute walk test

3.8 PARAMETERS

1. Systolic blood pressure
2. Diastolic blood pressure
3. Exercise capacity
4. Rate of perceived exertion

3.9 OUTCOME MEASURES

1. Six minute walk test
2. Borg scale

3.10 OPERATIONAL TOOLS

1. Stop watch
2. Sphygmomanometer
3. Stethoscope.
4. Cones

3.11 PROCEDURE

The study was conducted in department of general physician, cardiology, K.G hospital, Coimbatore. All the patients visiting the department of cardiology with essential hypertension were assessed and who fulfilled the inclusive criteria were selected for the study. A total of 40 patients were selected and divided into two groups ,Group A and Group B with 20 patients each. A clear explanation about the study was given to the selected patients and informed consent was obtained from the patients who agreed to participate. Blood pressure and exercise capacity measures were taken at the beginning of first day and at the end of the fourth week of treatment for each patient and collected the pre test, post test result.

SLOW BREATHING TRAINING

Patients were positioned in high sitting position in a relaxed and comfortable manner. Performed slow breathing exercises at six cycles per minute, followed by

two minutes rest for ten minutes. Place the both hands over the abdomen and ask them inhale deeply through nose exhale slowly through mouth. They should feel the movement of the diaphragm. Breathing was controlled by visual instruction and continuous of monitoring breathing rate. Instructions were given to repeat the same breathing exercises 4 times daily for one successful week.

AEROBIC EXERCISE TRAINING

Warm up period to prepare the body for work out which includes active stretching for 5 minutes. Exercises performed for 20 minutes of aerobic dancing which includes jumping, step up step down exercises with moderate intensity. Cool down period for 5 minutes for bring heart rate down and increase flexibility.

GROUP A [experimental group]

20 were treated with slow breathing training along with conventional physiotherapy(aerobic exercises).First, patients were performed with aerobic exercises. After the half an hour of rest period they treated with slow breathing training.

GROUP B [control group]

20 were treated with conventional physiotherapy alone(aerobic exercises)

A pre test values were taken to measure blood pressure by using sphygmomanometer and exercise capacity was assessed by six minute walk test for both groups with the use of Borg scale.

Frequency - 5 times / week. For 4 week.

Number of session - 1 sessions per day

SLOW BREATHING EXERCISES

Position of slow breathing exercises during inhale

Position of slow breathing exercises during exhale

AEROBIC EXERCISES

Aerobic exercise position for leg movement

Aerobic exercise position for arm movement

AEROBIC EXERCISES

Cycling exercise

Aerobic exercise position for arm movement

AEROBIC EXERCISE

Aerobic exercise position for leg movement

3.12 ETHICAL APPROVAL

The study was approved by the ethical committee of KG hospital Coimbatore.

3.13 STASTISTICAL TOOLS

The following statistical tools were used to analyses blood pressure, exercise capacity. The paired 't' test was used to compare the pre and post test values for Group A& B.

Formula: Paired t-test

$$S = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\overline{d}\sqrt{n}}{s}$$

Where,

d = difference between the pretest versus post test

$\overline{d}$ = mean difference

n = total number of subjects

S = standard deviation

Unpaired 't' test:

The unpaired't' test was used to compare the posttest values between the two groups.

Formula: Unpaired t-test

$$S = \sqrt{\frac{\sum\left(X_1 - \overline{X_1}\right)^2 + \sum\left(X_2 - \overline{X_2}\right)^2}{n_1 + n_2 - 2}}$$

$$t = \frac{\overline{X_1} - \overline{X_2}}{S} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where,

x1 = Total number of subjects in Group A

x2 =Total number of subjects in Group B

$\overline{x_1}$ = Mean of Group A

$\overline{x_2}$ = Mean of Group B

$\sum$ = Sum of the value

n_1 = Number of subjects in Group A

n2 = Number of subjects in Group B

S = Standard deviation

Level of significance 5%

IV DATA ANALYSIS AND INTERPRETATION

TABLE -I

SYSTOLIC BLOOD PRESSURE

PAIRED 't' TEST- PRE & POST VALUES OF

GROUP A

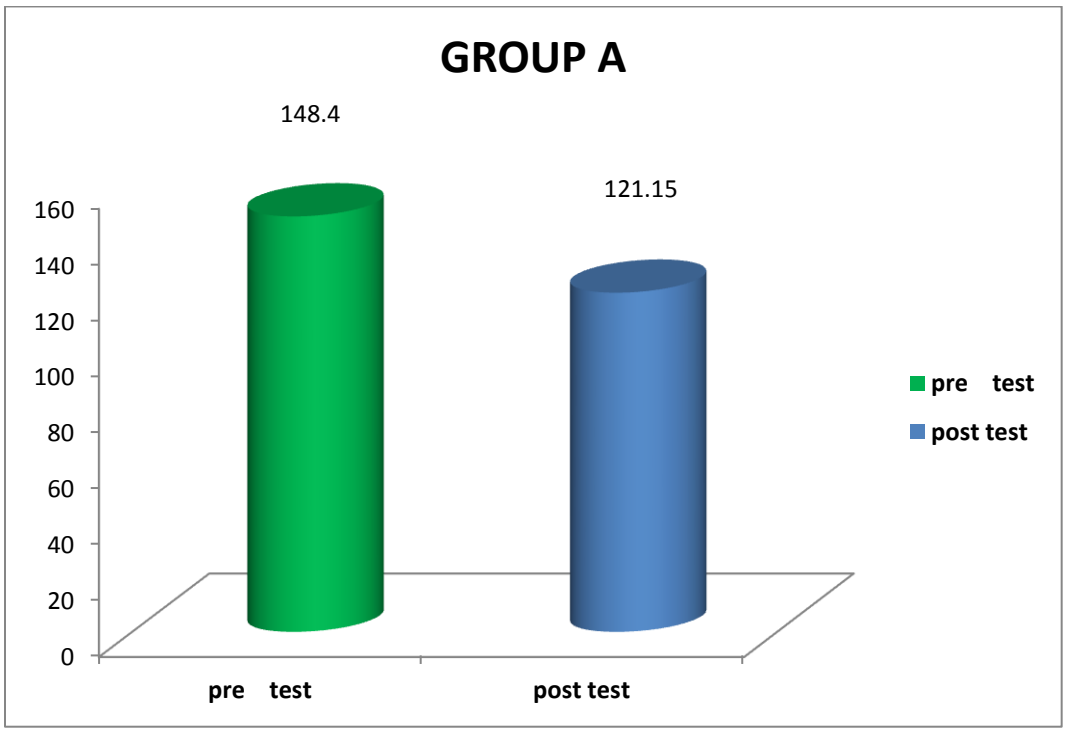
The mean values, mean differences, standard deviation and paired 't' values of systolic blood pressure for Group A.

S.NO	GROUP A	MEAN VALUE	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED 't' TEST
1	Pre test	148.40	27.25	4.592	18.44
2	Post test	121.15			

Table I shows analysis of systolic blood pressure on paired test. The calculated value for group A was 18.44 at 0.05 % level of significance which was greater than tabulated value 2.093. The result shows that there was marked improvement between pre and post values in Group A.

GRAPH I

GRAPICAL REPRESENTATION OF PRE TEST, POST TEST VALUES OF SYSTOLIC BLOOD PRESSURE IN GROUP A.



X - Pre test and post test values of Group A

Y - Level of Systolic Blood Pressure.

TABLE -II

SYSTOLIC BLOOD PRESSURE

PAIRED 't' TEST- PRE & POST VALUES OF

GROUP B

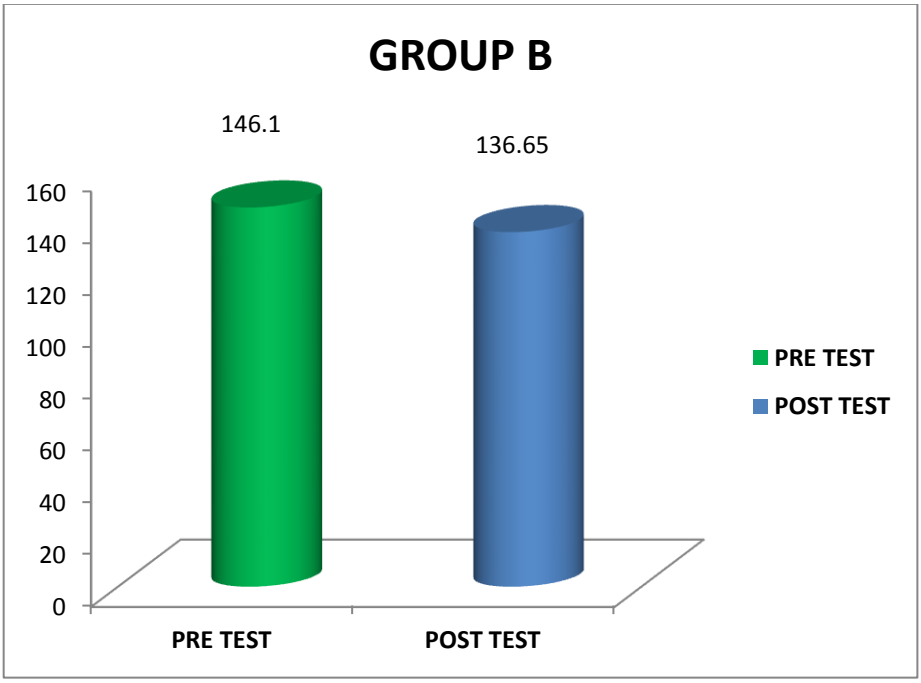
The mean values, mean differences, standard deviation and paired 't' values of systolic blood pressure for Group B.

S.NO	GROUP B	MEAN VALUES	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED 't' TEST
1	Pre test	146.10	9.55	6.540	7.322
2	Post test	136.65			

Table II shows analysis of systolic blood pressure on paired test. The calculated value for group B was 7.322 at 0.05 % level of significance which was greater than tabulated value 2.093. The result shows that there was marked improvement between pre and post values in Group B.

GRAPH II

GRAPICAL REPRESENTATION OF PRE TEST, POST TEST VALUES OF SYSTOLIC BLOOD PRESSURE IN GROUP B.



X - Pre test and post test values of Group B

Y - Level of Systolic Blood Pressure

TABLE -III

SYSTOLIC BLOOD PRESSURE

UNPAIRED 't' TEST- PRE TEST VALUES OF

GROUP A AND GROUP B

The mean values, mean differences, standard deviation and unpaired 't' values of systolic blood pressure for Group A and Group B.

S.NO	GROUP	MEAN VALUE	MEAN DIFFERENCE	STANDARD DEVIATION	UNPAIRED 't' TEST
1	Group A	148.65	2.25	5.6550	1.425
2	Group B	146.10			

Table III shows analysis of systolic blood pressure on unpaired test. The calculated value for group A and B was 1.425 at 0.05 % level of significance which was lesser than tabulated value 1.960. The result shows that there was no marked difference between pre test values.

TABLE -IV

SYSTOLIC BLOOD PRESSURE

UNPAIRED 't' TEST- POST VALUES OF

GROUP A AND GROUP B

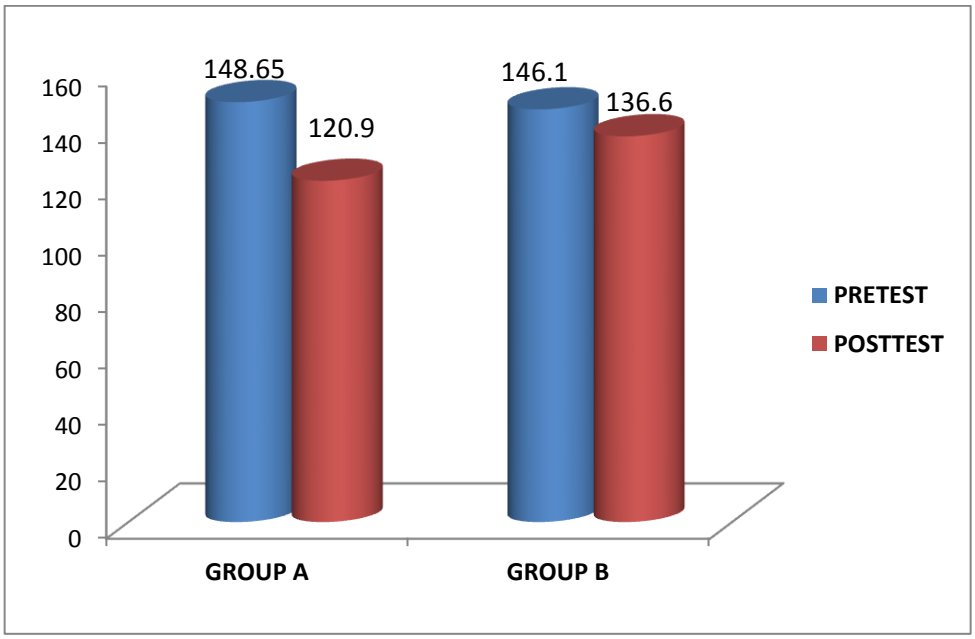
The mean values, mean differences, standard deviation and unpaired 't' values of systolic blood pressure for Group A and Group B.

S.NO	GROUP	MEAN VALUE	MEAN DIFFERENCE	STANDARD DEVIATION	UNPAIRED 't' TEST
1	Group A	120.90	16.60	5.527	8.983
2	Group B	136.60			

Table IV shows analysis of systolic blood pressure on unpaired test. The calculated value for group A and B was 8.983 at 0.05 % level of significance which was greater than tabulated value 1.960. The result shows that there was marked improvement between post test values.

GRAPH III

GRAPICAL REPRESENTATION OF PRE AND POST TEST VALUES OF SYSTOLIC BLOOD PRESSURE IN GROUP A AND GROUP B.



X - Pre test and post test values of Group A and Group B

Y - Level of Systolic Blood Pressure .

TABLE -V

DIASTOLIC BLOOD PRESSURE

PAIRED 't' TEST- PRE & POST VALUES OF

GROUP A

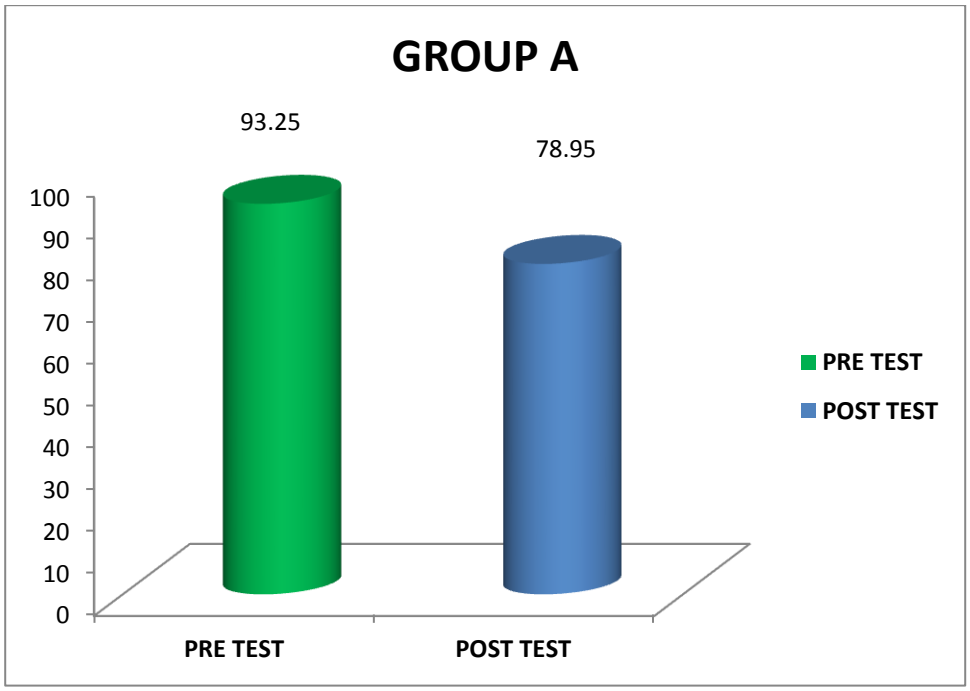
The mean values, mean differences, standard deviation and paired 't' values of diastolic blood pressure for Group A.

S.NO	GROUP A	MEAN VALUE	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED 't' TEST
1	Pre test	93.25	14.30	2.475	17.838
2	Post test	78.95			

Table V shows analysis of diastolic blood pressure on paired test. The calculated value for group A was 17.838 at 0.05 % level of significance which was greater than tabulated value 2.093. The result shows that there was marked improvement between pre and post values.

GRAPH IV

GRAPICAL REPRESENTATION OF PRE TEST, POST TEST VALUES OF DIASTOLIC BLOOD PRESSURE IN GROUP A.



X - Pre test and post test values of Group A

Y - Level of Diastolic Blood Pressure.

TABLE -IV

DIASTOLIC BLOOD PRESSURE

PAIRED 't' TEST- PRE & POST VALUES OF

GROUP B

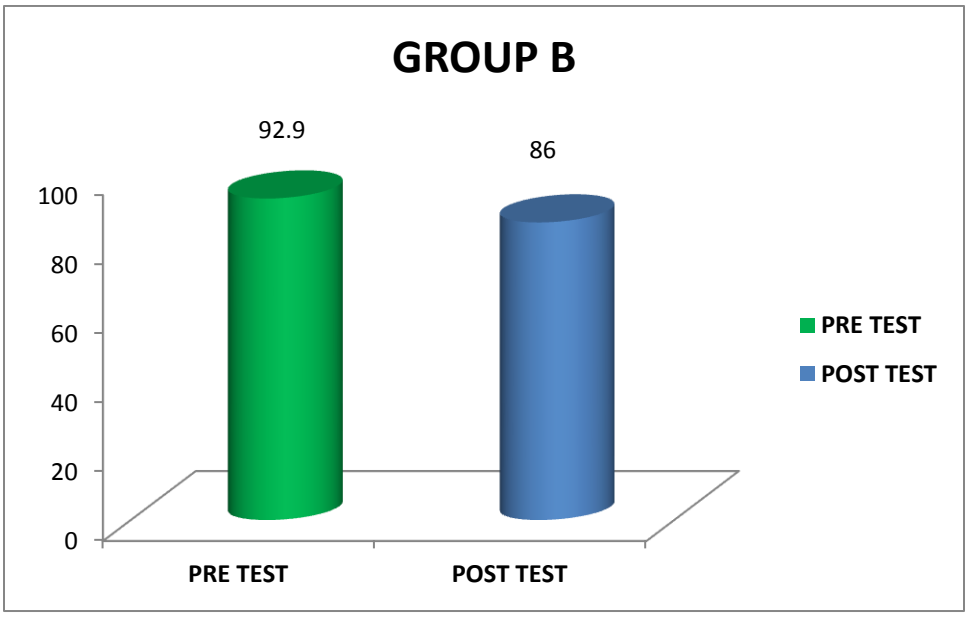
The mean values, mean differences, standard deviation and paired 't' values of diastolic blood pressure for Group B.

S.NO	GROUP B	MEAN VALUES	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED 't' TEST
1	Pre test	92.90	6.90	3.05	11.375
2	Post test	86.00			

Table VI shows analysis of diastolic blood pressure on paired test. The calculated value for group B was 11.375 at 0.05 % level of significance which was greater than tabulated value 2.093. The result shows that there was marked improvement between pre and post values.

GRAPH V

GRAPICAL REPRESENTATION OF PRE TEST, POST TEST VALUES OF DIASTOLIC BLOOD PRESSURE IN GROUP B.



X - Pre test and post test values of Group B

Y - Level of Diastolic Blood Pressure

TABLE -VII

DIASTOLIC BLOOD PRESSURE

UNPAIRED 't' TEST- PRE TEST VALUES OF

GROUP A AND GROUP B

The mean values, mean differences, standard deviation and unpaired 't' values of diastolic blood pressure for Group A and Group B.

S.NO	PRE TEST	MEAN VALUES	MEAN DIFFERENCE	STANDARD DEVIATION	UN PAIRED 't' TEST
1	Group A	93.25	0.35	3.146	0.352
2	Group B	92.90			

Table VII shows analysis of diastolic blood pressure on unpaired test. The calculated value for group A and B was 0.352 at 0.05 % level of significance which was lesser than tabulated value 1.960. The result shows that there was no marked difference between pre test values.

TABLE -VIII

DIASTOLIC BLOOD PRESSURE

UNPAIRED 't' TEST- POST VALUES OF

GROUP A AND GROUP B

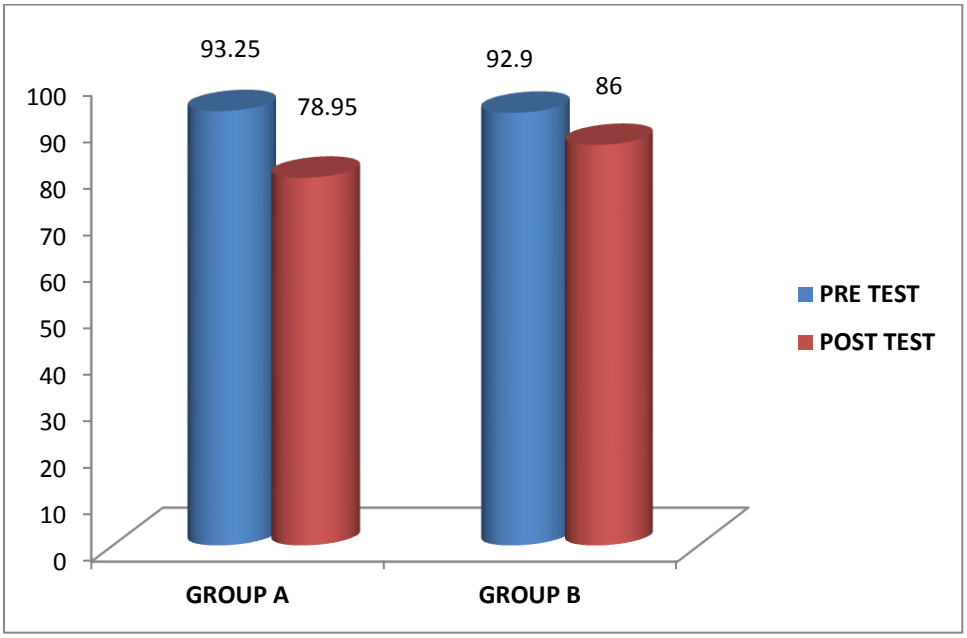
The mean values, mean differences, standard deviation and unpaired 't' values of diastolic blood pressure for Group A and Group B.

S.NO	POST TEST	MEAN VALUES	MEAN DIFFERENCE	STANDARD DEVIATION	UN PAIRED 't' TEST
1	Group A	78.95	7.05	2.351	9.462
2	Group B	86.00			

Table VIII shows analysis of diastolic blood pressure on unpaired test. The calculated value for group A and B was 9.462 at 0.05 % level of significance which was greater than tabulated value 1.960. The result shows that there was marked improvement between post test values.

GRAPH VI

GRAPICAL REPRESENTATION OF PRE AND POST TEST VALUES OF DIASTOLIC BLOOD PRESSURE IN GROUP A AND GROUP B.



X - Pre test and post test values of Group A and Group B

Y - Level of Diastolic Blood Pressure .

TABLE -IX

SIX MINUTE WALK TEST

PAIRED 't' TEST- PRE & POST VALUES OF

GROUP A

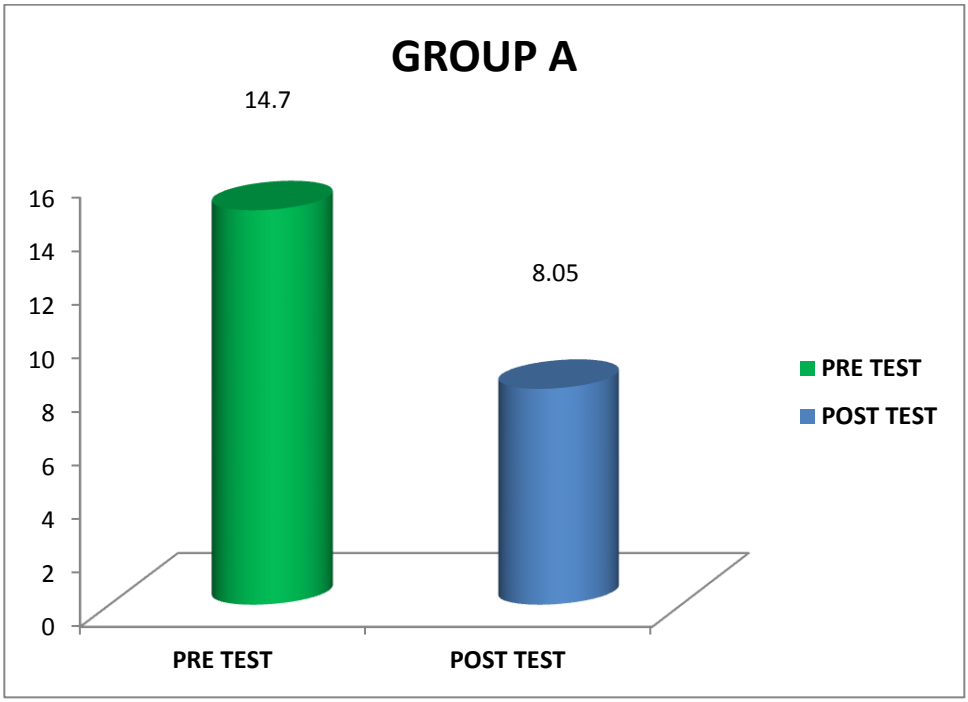
The mean values, mean differences, standard deviation and paired 't' values of six minute walk test for Group A.

S.NO	GROUP A	MEAN VALUES	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED 't' TEST
1	Pre test	14.70	6.65	1.138	22.721
2	Post test	8.05			

Table IX shows analysis of six minute walk test on paired test. The calculated value for group A was 22.721 at 0.05 % level of significance which was greater than tabulated value 2.093. The result shows that there was marked improvement between pre and post values.

GRAPH VII

GRAPICAL REPRESENTATION OF PRE TEST, POST TEST VALUES OF SIX MINUTE WALK TEST IN GROUP A.



X - Pre test and post test values of Group A

Y - Rate of Perceived Exertion

TABLE -X

SIX MINUTE WALK TEST

PAIRED 't' TEST- PRE & POST VALUES OF

GROUP B

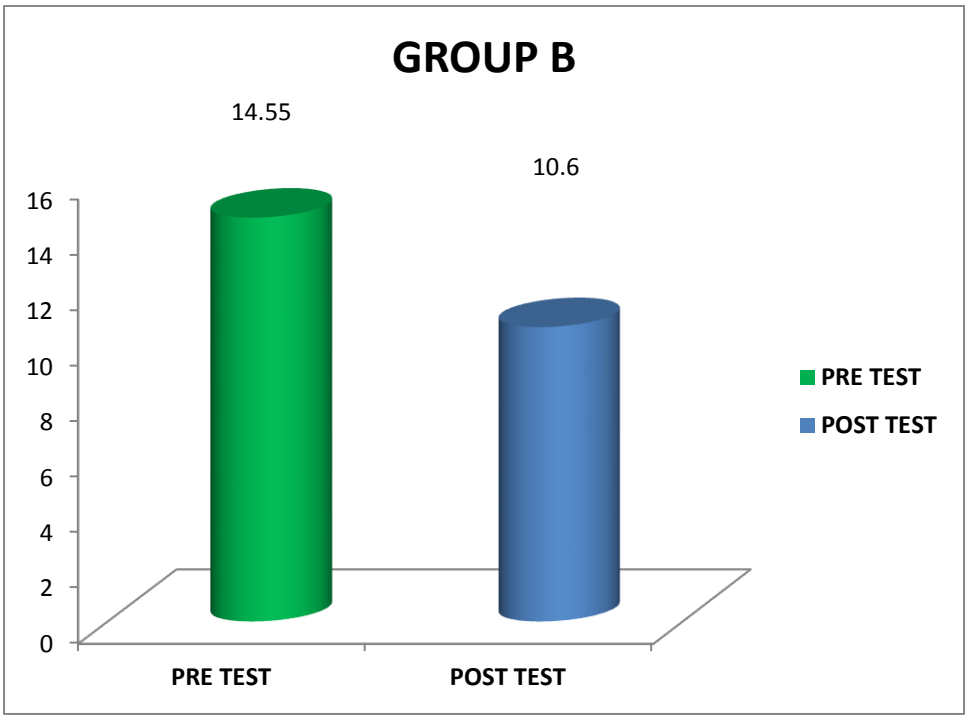
The mean values, mean differences, standard deviation and paired 't' values of six minute walk test for Group B.

S.NO	GROUP B	MEAN VALUE	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED 't' TEST
1	Pre test	14.55	3.95	1.394	23.269
2	Post test	10.60			

Table X shows analysis of six minute walk test on paired test. The calculated value for group B was 23.269 at 0.05 % level of significance which was greater than tabulated value 2.093. The result shows that there was marked improvement between pre and post values.

GRAPH VII

GRAPICAL REPRESENTATION OF PRE TEST, POST TEST VALUES OF SIX MINUTE WALK TEST IN GROUP B.



X - Pre test and post test values of Group B

Y - Rate of Perceived Exertion

TABLE XI

SIX MINUTE WALK TEST

UNPAIRED 't' TEST- PRE TEST VALUES OF

GROUP A AND GROUP B

The mean values, mean differences, standard deviation and unpaired 't' values of six minute walk test for Group A and Group B.

S.NO TEST	GROUP	MEAN VALUE	MEAN DIFFERENCE	STANDARD DEVIATION	UN PAIRED 't' TEST
1	GROUPA	14.70	0.25	1.351	0.351
2	GROUPB	14.55			

Table XI shows analysis of six minute walk test on unpaired test. The calculated value for group A and B was 0.351 at 0.05 % level of significance which was lesser than tabulated value 1.960. The result shows that there was no marked difference between pre test values.

TABLE 12

SIX MINUTE WALK TEST

UNPAIRED 't' TEST- POST VALUES OF

GROUP A AND GROUP B

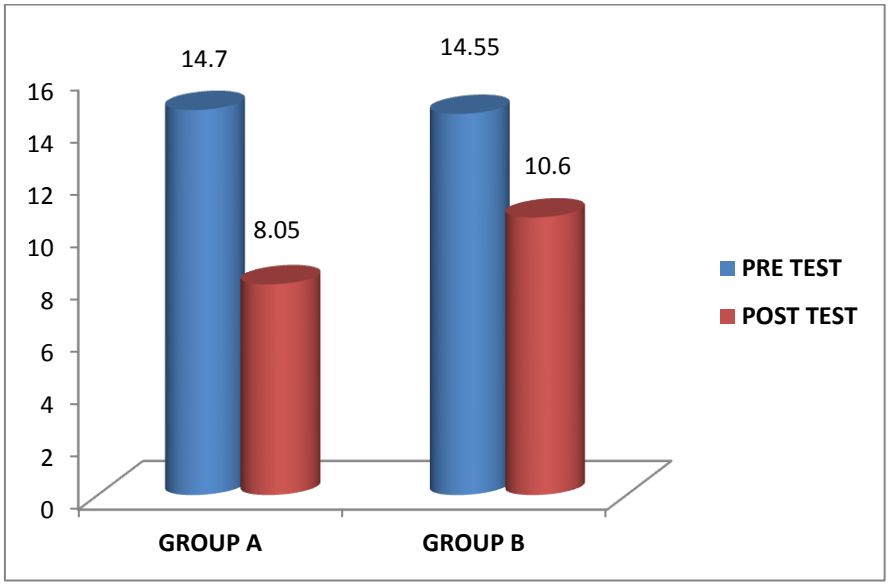
The mean values, mean differences, standard deviation and unpaired 't' values of six minute walk test for Group A and Group B.

S.NO TEST	POST TEST	MEAN VALUE	MEAN DIFFERENCE	STANDARD DEVIATION	UN PAIRED 't' TEST
1	GROUP A	8.05	2.65	1.189	6.780
2	GROUP B	10.60			

Table XII shows analysis of six minute walk test on unpaired test. The calculated value for group A and B was 6.780 at 0.05 % level of significance which was greater than tabulated value 1.960. The result shows that there was marked improvement between post test values.

GRAPH IX

GRAPICAL REPRESENTATION OF PRE AND POST TEST VALUES OF SIX MINUTE WALK TEST IN GROUP A AND GROUP B.



X - Pre test and post test values of Group A and Group B

Y - Rate of Perceived Exertion

RESULTS

Table I and II shows paired t test for systolic blood pressure. It has pre and post test values of Group A and Group B. Both the group show significant differences in the pre test and post test values. The 't' value for the Group A is18.44 ; the 't' value for the Group B is 7.32.

Table III and IV shows unpaired test for systolic blood pressure. There was a significant difference shown between the Groups. Subjects in Group A show superior mean difference than Group B. The't' value for the post test variables for both groups is 8.98 .

Table V and VI shows paired t test for diastolic blood pressure. It has pre and post test values of Group A and Group B. Both the group show significant differences in the pretest and post test values. The 't' value for the Group A is17.83 ; the 't' value for the Group B is 11.37.

Table VII and VIII shows unpaired test for diastolic blood pressure. There was a significant difference shown between the Groups. Subjects in Group A show superior mean difference than Group B. The't' value for the post test variables for both groups is 9.46 .

Table IX and X shows paired t test for six minute walk test. It has pre and post test values of Group A and Group B. Both the group show significant differences in the pre test and post test values. The 't' value for the Group A is 22.72 ; the 't' value for the Group B is 23.26.

Table XI and XII shows unpaired test for six minute walk test. There was a significant difference shown between the Groups. Subjects in Group A show superior mean difference than Group B. The't' value for the post test variables for both groups is 6.78.

V DISCUSSION

The purpose of the study is to find out the effect of slow breathing training along with conventional physiotherapy in cardio respiratory control in patients with essential hypertension.

40 patients with the age group of 45-55 years were randomly selected for the study. All were following inclusion and exclusion criteria. A detailed examination was done by a senior cardio surgeon and senior physiotherapist for the inclusion of the participants for the study. After a clear explanation to the patients, those who are willing were selected and randomly assigned into two groups.

Group A underwent slow breathing training along with aerobic exercises. Group B underwent aerobic exercises alone. Following the 4 weeks of interventions the outcome were measured. The blood pressure were measured by sphygmomanometer and exercise capacity were measured by six minute walk test by using Borg scale.

Hypertension remains a major public health problem in united states 55.4 million Americans aged 18 years are having hypertension. The prevalence of hypertension is estimated to be between 24-29% in United states adult population (Hajjar. I, J.A.Kotchan 2003).

Essential hypertension patients having decreased physical activity which is contribute to the reduction in muscle mass and strength, atrophy of slow twitch, oxidative endurance muscle fibers, reduction in fiber capillarization, oxidative enzyme capacity and muscle endurance. The aerobic training can improve muscle growth and strength and increase the peak oxygen consumption and total work of work capacity, decrease arterial stiffening, prevent cardiovascular disease.

This study was aimed to determine the effects of slow breathing exercises along with aerobic exercises to lowering the blood pressure and improving the exercise capacity in patients with essential hypertension.

Aerobic exercises were prescribed for hypertensive patients traditionally. Slow breathing exercises also reduces the blood pressure. When both the exercises are combined it doubles the effect of reducing blood pressure. The current study findings showed that more than two thirds of the study sample their age ranged between 40-50 which indicates that essential hypertension is increase with age according to Mohamed, millet 2013.

Hypertension is mainly characterized by autonomic imbalance. The mechanism responsible for autonomic imbalance is reduced baroreflex sensitivity and increased chemoreflex activation which leads to decreased exercise tolerance ,elevated peripheral resistance.

A study on essential hypertension patients by CN joseph et.al indicates that overall patients with essential hypertension have reduced exercise capacity due to increased blood pressure.

Slow breathing exercise training at 7-8 breaths/mint for 10 mints was Improve autonomic balance by reduce the sympathetic activity through herring breurreflex. It improves blood and oxygen flow to brain. It creates a connection between mind and body that can lead to greater energy level and helps the body to eliminate toxins as well as reduces stress(shakeshaft,2012).

Aerobic exercise training was reduce peripheral vascular resistance by decreasing sympathetic activity and increasing vagal activity. It improves endothelial function and reduces blood pressure through the endothelium derived relaxing factors such as nitric oxide.

The moderate intensity exercises seems to be the most effective for reducing blood pressure in essential hypertension patients. This would be equilent to 1.5 miles per day of brisk walking at an energy cost of 150k cal per day. This exercise intensity can be accomplished much easier in middle old age. Vigorous exercises contribute to musculoskeletal injurious.(Harald Edward Hansen,2000).

Six minute walk test evaluates the distance , a person can walk on a flat. The test is done for determine exercise tolerance and oxygen saturation. Exercise

capacity of essential hypertension patients was decreased because of poor blood circulation to the muscles. Six minute walk test is a useful to evaluate the functional capacity and quantifying the exercise tolerance. (sao Paulo,2011).

Regular exercises is a well established intervention for the prevention and treatment for essential hypertension by reducing the arterial stiffness according to Emmanuel gomes2012. According to HK kim states that reduced exercise capacity was the major problem in patients with essential hypertension which will affect the functional capacity.

The study results showed more statistical significance improvement with relation to lowering blood pressure and improves exercise capacity were obtained from group A patients performing slow breathing exercises along with aerobic exercise. The result of this study correlates with the previous studies LAE Mohamed,JARuivo et al 2012,CN joseph 2005.

Perceived exertion can be defined as the act of deflecting and interpreting sensation arising from the body during physical exercises. Rate of perceived exertion is relative to an individual perception of maximum effect. Perceived exertion was studied by Gunner Borg in 1962 to quantify the physiological feeling of perceived exertion in relation to actual physiologic work being performed. It is the valuable and reliable indicator in monitoring an individual exercise tolerance.

VI SUMMARY AND CONCLUSION

SUMMARY

The purpose of the study is to find out the effect of slow breathing training along with conventional physiotherapy in cardio respiratory control in patients with essential hypertension.

40 patients with the age group of 45-55 years were randomly selected for the study. All were following inclusion and exclusion criteria. A detailed examination was done by a senior cardio surgeon and senior physiotherapist for the inclusion of the participants for the study. After a clear explanation to the patients, those who are willing were selected and randomly assigned into two groups.

Group A underwent slow breathing training along with aerobic exercises. Group B underwent aerobic exercises alone. Following the 4 weeks of interventions the outcome were measured. The blood pressure were measured by sphygmomanometer and exercise capacity were measured by six minute walk test by using Borg scale.

Student ‘t’ test was used to find the difference between the pre test outcome as well as the difference between the two groups. Based on the statistical analysis the group A patients showed a marked reduction in blood pressure and improvement in exercise capacity when compared to Group B patients.

CONCLUSION

1. There is significant reduction of blood pressure in both groups.
2. There is significant improvement of exercise capacity in both groups.
3. When compared with Group B(control group), Group A shows a marked reduction in blood pressure.
4. When compared with Group B(control group), Group A shows a marked improvement in exercise capacity.

So, Analysis of the study concludes that slow breathing exercises along with conventional physiotherapy is the most beneficial effective than the aerobic exercises alone in patients with essential hypertension.

This study supports the alternate hypothesis which states that there is a significant improvement in cardio respiratory control and exercise capacity by slow breathing exercise along with aerobic exercise.

VII LIMITATION AND RECOMMENDATION

LIMITATION

a. The study was conducted when the allergic stimuli were minimal.
b. Certain factors such as climate condition, nutritional status and psychological status could not be controlled during the period of study
c. Drug profile was followed as such as by the cardiologist.
d. Study sample was very small
e. Study duration is limited

RECOMMENDATION

a. Similar study can be done on patients with secondary hypertension.
b. Similar study can be done with more number of subjects.
c. Can be performed for a longer study duration.
d. Similar study can be done for other metabolic disorders
e. Study can be compared with other forms of exercises
f. The study samples can taken without medication also.

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X.APPENDIX

APPENDIX - I

BLOOD PRESSURE

Blood pressure refers to the force exerted by blood on the walls of blood vessels and constitutes one of the principal vital signs. Arterial pressure is the most commonly measured via a sphygmomanometer and uses the height of the mercury to reflect the circulating pressure. Blood pressure values are millimeter of mercury.(mmHg).

The systolic pressure is defined as the peak pressure in the arteries to occur near the beginning of the cardiac cycle, the diastolic arterial pressure is the lowest pressure at the resting phase cardiac cycle. The average pressure throughout the cardiac cycle is reported as mean arterial pressure.

The pulse pressure reflects the difference between the maximal and minimal pressure measures. Normal resting blood pressure is 120/80 mmHg. The auscultatory methods use a stethoscope and sphygmomanometer.

APPENDIX - II

SPHYGMOMANOMETER

Arterial blood pressure can be measured by two methods.

1) Direct
2) Indirect

In direct method, the artery is exposed and the pressure is measured. In indirect method, the pressure may be measured without any surgical procedure and it is very convenient in human being. In this method commonly the pressure of the brachial artery is measured. The instrument used is known as sphygmomanometer.

Methods

1) Oscillatory
2) Palpatory
3) Auscultatory

The instrument is kept at the level of the heat and the cuff is tied around the upper arm. Pressure is raised to 200mmHg and then gradually released. Variations of sounds are heard with a stethoscope placing its chest piece on the brachial artery, a little below the cuff. The sounds are heard due to occurrence of turbulence in the flow of blood through the narrowed blood vessels. When the manometer pressure just coincides with the systolic blood pressure.

APPENDIX III

BORG SCALE

0	-	Nothing at all
1	-	Very slight
2	-	Light
3	-	Moderate
4	-	Somewhat severe
5	-	Severe
6		
7	-	Very severe
8		
9		
10	-	Very very severe

This Borg scale should be printed on heavy paper at the beginning of the 6 minute exercise, show the scale to the patient and ask the patient to grade his level of shortness of breath using this scale.

APPENDIX - IV

SIX MINUTE WALK TEST

Six Minute Walk Test was performed in an open area. Each of the participants walked slowly or at a normal pace, and no verbal encouragement was given. The subjects performed the 6 minute walk test in a quiet hospital corrider,50m in length. Measurement differs depending on age, gender, height and weight.

MEASUREMENTS

1. Repeat testing should be performed about the same time of day to minimize intraday variability.

2. A “warm-up” period before the test should not be performed.

3. The patient should sit at rest in a chair, located near the starting position. For at least 10 minutes before the test starts, During this time, check for contraindications, measure pulse and blood pressure and make sure that

clothing and shoes are appropriate .Complete the first portion of the worksheet.

4. Pulseoximetry is optimal. If it is performed, measure and record baseline heart rate and oxygen saturation.

5. Have the patient stand and rate their baseline dyspnea and overall fatigue using the Borg scale .

6. Set the lap counter to zero and the timer to six minutes. Assemble all necessary equipment and move to the starting point.

7. Instruct the patient as follows.

"The object of this test is to walk as far as possible for 6 minutes. You will walk back and forth in this halfway. Six minutes is a long time to walk, so you will be exerting yourself. You are permitted to slow down, to stop and to rest as necessary. You may lean against the wall while resting, but resume walking as soon as you are able.

You will be walking back and forth around the cones. You should pivot briskly around the cones and continue back the other way without hesitation. Now I'm going to show you. Please watch the way I turn without hesitation."

Demonstrate by walking one lap yourself. Walk and pivot around a cone briskly.

If the patient stops walking during the test and needs a rest, say this:' You can lean against the wall is you would like; then continue walking whenever you feel able ",Do not stop the timer. If the patient stops before the 6minutes are up and refuses to continue(or you decide that they should not continue),wheel the chair over for the patient to sit on, discontinue the walk and note on the worksheet the distance, the time stopped and the reason for stopping prematurely.

8. If using a pulse oximeter, measure Spo2 and pulse rate from the oximeter and then remove the sensor.

9. Record the number of laps from the counter.

10. Record the additional distance covered using the markers on the wall as distance guides. Calculate the total distance walked rounding to the nearest meter, and record it on the worksheet.

APPENDIX V

AEROBIC EXERCISES

Aerobic exercises are the exercises performed with the utilization of oxygen. Aerobic training is effective method in lowering the blood pressure. It will improve endothelial function and cardio respiratory capacity. Depending upon the intensity of the exercises the blood pressure reduced. The exercises includes aerobic dancing and cycling in a moderate intensity.

Warm up period to prepare the body for work out which includes active stretching for 5 minutes.

Exercises performed for 20 minutes which includes aerobic dancing, jumping, step up step down exercises with moderate intensity.

Cool down period for 5 minutes for bring heart rate down and increase flexibility.

APPENDIX –VI

PATIENT CONSENT FORM

I ……voluntarily consent to participate in the project named "**THE EFFECTIVENESS OF SLOW BREATHING TRAINING ALONG WITH CONVENTIONAL PHYSIOTHERAPY IN IMPROVING CARDIO RESPIRATORY CONTROL AND EXERCISE CAPACITY IN PATIENTS WITH ESSENTIAL HYPERTENSION**"

The candidate has explained to me that treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfication.

Participant's Signature :

Signature of witness :

Signature of candidate :

Date :